PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2001-264697

(43)Date of publication of application : 26.09.2001

(51)Int.Cl. G02B 27/28
G02F 1/13
G02F 1/13357
G03B 21/14
G03B 33/12
G09F 9/00
H04N 5/74

(21)Application number : 2000-075418

(22)Date of filing : 17.03.2000

(71)Applicant : FUJITSU GENERAL LTD

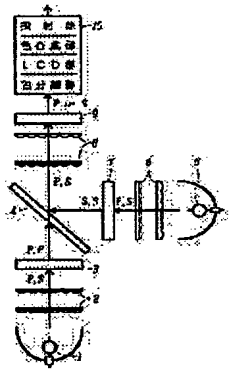
(72)Inventor : TAKAHASHI MAKOTO

(54) PROJECTOR DEVICE

(57)Abstract:

PROBLEM TO BE SOLVED: To enhance the use efficiency of light beams from light source lamps and, at the same time, to improve quality in a projection image by permitting the light beams from the two light source lamps to coincide in light axis and to be superimposed.

SOLUTION: The light beams from the light source lamp 1 are converged in an integrator lens 2, aligned with p-polarization light beams by a PBS array 3 and made to pass through a PBS 4. The light beams from the light source lamp 5 are converged in an integrator lens 6, aligned to s-polarization light beams by a PBS array 7 and reflected by the PBS 4. The p and s-polarization light beams from the PBS 4 are converged in an integrator lens 8, aligned with the p or s-polarization light beams by a PBS array 9 and made incident on a succeeding stage optical system 10. The light source lamp 5, the integrator lens 6 and the PBS array 7 are arranged to permit the light axis of the light beams from the light source lamp 5, which are reflected by the PBS 4, to coincide with the light axis of the light beams from the light source lamp 1.



LEGAL STATUS

[Date of request for examination]

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision of rejection]

[Date of requesting appeal against examiner's decision of rejection]

[Date of extinction of right]

CLAIMS

[Claim(s)]
[Claim 1] The 1st light source lamp and the 1st PBS (polarization beam splitter) array which carries out incidence of the beam of light from the 1st light source lamp through the 1st integrator lens, is arranged and carries out outgoing radiation to the 1st polarization beam of light of predetermined plane of polarization, The 2nd PBS array which carries out incidence of the beam of light from the 2nd light source lamp and the 2nd light source lamp through the 2nd integrator lens, is arranged and carries out outgoing radiation to the 2nd polarization beam of light of plane of polarization different 90 degrees from said 1st polarization beam of light, PBS which reflects the 2nd polarization beam of light from the 2nd PBS array while penetrating the 1st polarization beam of light from said 1st PBS array is prepared. So that it may agree with the optical axis of the 1st polarization beam of light with which the optical axis of the 2nd polarization beam of light reflected by PBS penetrates PBS Said 2nd light source lamp, Projector equipment which arranges the 2nd integrator lens and the 2nd PBS array, carries out incidence of the 1st polarization beam of light and the 2nd polarization beam of light from PBS to latter optical system, performs light modulation, and was projected on the screen.
[Claim 2] While said 1st PBS array penetrates the 1st polarization beam of light by which incidence is carried out through the 1st integrator lens It comes to be what changes and carries out outgoing radiation of the 2nd polarization beam of light by which incidence is carried out to the beam of light of the same plane of polarization as the 1st polarization beam of light. Said 2nd PBS array Projector equipment according to claim 1 which comes to be what changes and carries out outgoing radiation of the 1st polarization beam of light by which incidence is carried out to the beam of light of the same plane of polarization as the 2nd polarization beam of light while penetrating the 2nd polarization beam of light by which incidence is carried out through the 2nd integrator lens.
[Claim 3] The 3rd PBS array which the optical system of said latter part carries out incidence of the 1st polarization beam of light and the 2nd polarization beam of light from said PBS through the 3rd integrator lens, and arranges and carries out outgoing radiation of the plane of polarization, The beam of light from the 3rd PBS array Red and the color separation section divided into the beam of light of green and blue, The liquid crystal panel of three sheets of ** is irradiated, and light modulation is carried out based on a video signal. the red from the color separation section — the beam of light of green and blue — red — green and blue — with red and the liquid crystal panel section which carries out outgoing radiation of green and the blue image beam of light Red from the liquid crystal panel section, projector equipment according to claim 1 which it comes to constitute from green, and the color composition section which compounds a blue image beam of light and the projection area which projects the image beam of light from the color composition section on a screen.
[Claim 4] Said liquid crystal panel of three sheets is projector equipment according to claim 3 which used the thing of the format which carries out light modulation of the 1st polarization beam of light using what changes and carries out outgoing radiation of the 2nd polarization beam of light to the beam of light of the same plane of polarization as the 1st polarization beam of light while said 3rd PBS array penetrates the 1st polarization beam of light from said PBS.
[Claim 5] Said liquid crystal panel of three sheets is projector equipment according to claim 3 which used the thing of the format which carries out light modulation of the 2nd polarization beam of light using what changes and carries out outgoing radiation of the 1st polarization beam of light to the beam of light of the same plane of polarization as the 2nd polarization beam of light while said 3rd PBS array penetrates the 2nd polarization beam of light from said PBS.
[Claim 6] The optical system of said latter part the 1st polarization beam of light and the 2nd polarization beam of light from said PBS Red and the color separation section divided into the beam of light of green and blue, With the beam of light of the red from the color separation section, green, and blue, red and the light reflex component section which irradiates green and the mirror component of each pixel for blue, is made to rotate a mirror component according to each pixel based on a video signal, and reflects an incident ray in the predetermined

direction, Projector equipment according to claim 1 which it comes to constitute from the color composition section which compounds the image beam of light of three colors reflected in the light reflex component section, and a projection area which projects the image beam of light from the color composition section on a screen.
[Claim 7] It is projector equipment according to claim 1 to 6 said whose 1st polarization beam of light is a p-polarized light component and said whose 2nd polarization beam of light is an s-polarized light component.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to projector equipment and relates to the optical device for piling up the optical axis of the beam of light from two light source lamps.
[0002]
[Description of the Prior Art] In order to raise the brightness of projector equipment, when two light source lamps are used, For example, as shown in drawing 4 , the beam of light from two lamps 31 and 32 is reflected in this direction (upper part of drawing) by the triangular mirror 33. Latter optical system, i.e., the dichroic mirror in the case of a liquid crystal projector, Or although incidence is carried out to the light reflex component (for example, the DMD(Digital Micromirror Device) = U.S. and Texas Instruments, Inc.) in the case of a DLP (Digital Light Processing) projector etc. Since the path of optical-axis RO of the beam of light from optical-axis I and the lamp 32 of a beam of light from a lamp 31 reflected by the triangular mirror 33 is separate and the incident angles to latter optical system differ with the beam of light of optical-axis I, and the beam of light of optical-axis RO, For example, if it sets up so that the beam of light from one of lamps may carry out incidence by the optimal incident angle, the incident angle of the beam of light from the lamp of another side will be no longer an optimum value. Consequently, not only by decline in the use effectiveness of a beam of light but by color separation optical system, the precision of color separation falls and that a difference arises in the reflective direction etc. causes deterioration of image quality with a light reflex component.
[0003]
[Problem(s) to be Solved by the Invention] This invention makes an optical axis in agreement [the beam of light from two light source lamps], gathers the use effectiveness of the beam of light from superposition and a light source lamp, and aims at improving the quality of a projection image to coincidence.
[0004]
[Means for Solving the Problem] In order to attain the above-mentioned purpose, with the projector equipment of this invention The 1st light source lamp and the 1st PBS (polarization beam splitter) array which carries out incidence of the beam of light from the 1st light source lamp through the 1st integrator lens, is arranged and carries out outgoing radiation to the 1st polarization beam of light of predetermined plane of polarization, The 2nd PBS array which carries out incidence of the beam of light from the 2nd light source lamp and the 2nd light source lamp through the 2nd integrator lens, is arranged and carries out outgoing radiation to the 2nd polarization beam of light of plane of polarization different 90 degrees from the 1st polarization beam of light, PBS which reflects the 2nd polarization beam of light from the 2nd PBS array while penetrating the 1st polarization beam of light from the 1st PBS array is prepared. So that it may agree with the optical axis of the 1st polarization beam of light with which the optical axis of the 2nd polarization beam of light reflected by PBS penetrates PBS The 2nd light source lamp, The 2nd integrator lens and the 2nd PBS array are arranged, incidence of the 1st polarization beam of light and the 2nd polarization beam of light from PBS is carried out to latter optical system, light modulation is performed, and it is made to project on a screen.

[0005] While said 1st PBS array penetrates the 1st polarization beam of light by which incidence is carried out through the 1st integrator lens It comes to be what changes and carries out outgoing radiation of the 2nd polarization beam of light by which incidence is carried out to the beam of light of the same plane of polarization as the 1st polarization beam of light. The 2nd PBS array While penetrating the 2nd polarization beam of light by which incidence is carried out through the 2nd integrator lens, it changes and comes to carry out outgoing radiation of the 1st polarization beam of light by which incidence is carried out to the beam of light of the same plane of polarization as the 2nd polarization beam of light.

[0006] And the 3rd PBS array which carries out incidence of the 1st polarization beam of light and the 2nd polarization beam of light from PBS for latter optical system through the 3rd integrator lens, and arranges and carries out outgoing radiation of the plane of polarization, The beam of light from the 3rd PBS Red and the color separation section divided into the beam of light of green and blue, The liquid crystal panel of three sheets of ** is irradiated, and light modulation is carried out based on a video signal. the red from the color separation section — the beam of light of green and blue — red — green and blue — with red and the liquid crystal panel section which carries out outgoing radiation of green and the blue image beam of light The red from the liquid crystal panel section, and green and the color composition section which compounds a blue image beam of light and the projection area which projects the image beam of light from the color composition section on a screen are prepared and constituted.

[0007] In this case, that which changes the 2nd polarization beam of light into the beam of light of the same plane of polarization as the 1st polarization beam of light, and carries out outgoing radiation to it while penetrating the 1st polarization beam of light from PBS to the 3rd PBS array is used. [whether the liquid crystal panel of three sheets uses the thing of the format which carries out light modulation of the 1st polarization beam of light, and] Or the liquid crystal panel of three sheets uses the thing of the format which carries out light modulation of the 2nd polarization beam of light using that which changes the 1st polarization beam of light into the beam of light of the same plane of polarization as the 2nd polarization beam of light, and carries out outgoing radiation to it while penetrating the 2nd polarization beam of light from PBS to the 3rd PBS array.

[0008] Latter optical system the 1st polarization beam of light and the 2nd polarization beam of light from PBS Or red and the color separation section divided into the beam of light of green and blue, With the beam of light of the red from the color separation section, green, and blue, red and the light reflex component section which irradiates green and the mirror component of each pixel for blue, is made to rotate a mirror component according to each pixel based on a video signal, and reflects an incident ray in the predetermined direction, The color composition section which compounds the image beam of light of three colors reflected in the light reflex component section, and the projection area which projects the image beam of light from the color composition section on a screen may be prepared and constituted.

[0009] In addition, the above-mentioned 1st polarization beam of light is for example, a p-polarized light component, and the 2nd polarization beam of light is an s-polarized light component.

[0010]

[Embodiment of the Invention] The gestalt of implementation of invention is explained with reference to a drawing based on an example. Drawing 1 is the important section block diagram of one example of the projector equipment by this invention. 1 of drawing The 1st light source lamp, 2 the 1st PBS array and 4 for the 1st integrator lens and 3 PBS, 5 is the 2nd light source lamp and optical system which the 2nd PBS array and 8 become in the 2nd integrator lens and 7, and the 3rd PBS array and 10 become [6] from the color separation section, the LCD (liquid crystal panel) section, the color composition section, and a projection area in the 3rd integrator lens and 9.

[0011] It is condensed with the 1st integrator lens 2, and incidence of the white light line from the 1st light source lamp 1 is carried out to the 1st PBS array 3. The 1st PBS array 3 is constituted as shown for example, in drawing 2 (b). Incidence of the beam of light from the 1st integrator lens 2 is carried out to the a-b part of plane of incidence. The 1st polarization beam of light (p-polarized light component) rotates 90 degrees of plane of polarization, and it is changed into the 1st polarization beam of light, it carries out [the PBS side 11 is penetrated, the 2nd polarization beam of light (s-polarized light component) is reflected in respect of / 11 and 12 / PBS, and incidence is carried out to lambda/2 plate 13, and] outgoing radiation, and these 1st polarization beams of light penetrate PBS4. On the other hand, it is condensed with the 2nd integrator lens 6, and incidence of the white light line from the 2nd light source lamp 5 is carried out to the 2nd PBS array 7. The 2nd PBS array 7 is constituted as shown for example, in drawing 2 (b). Incidence of the beam of light from the 2nd integrator lens 6 is carried out to the c-d part of plane of incidence. It becomes the 2nd polarization beam of light (s-polarized light component), and it is reflected in respect of [14 and 15] PBS, and the 1st polarization beam of light (p-polarized

light component) penetrates the PBS side 14, and 90 degrees of plane of polarization are rotated with lambda/2 plate 13, and it is reflected [outgoing radiation is carried out and / outgoing radiation of the 2nd polarization beam of light from the 2nd integrator lens 6 is carried out, and] by PBS4. At this time, the 2nd light source lamp 5, the 2nd integrator lens 6, and the 2nd PBS array 7 are arranged so that the optical axis of the beam of light from the 1st light source lamp 5 reflected by PBS4 may agree with the optical axis of the beam of light from the 1st light source lamp 1.

[0012] In the case of liquid crystal-type projector equipment, as shown in drawing 1 , the 1st and 2nd polarization beam of light from PBS4 is condensed with the 3rd integrator lens 8. Arrange plane of polarization by the 3rd PBS array 9, and it considers as the 1st polarization beam of light or the 2nd polarization beam of light. Incidence is carried out to the color separation section (it constitutes from a dichroic mirror etc.) of the latter optical system 10. Separate into the beam of light of red, green, and blue, and the red of the LCD section, green, and the liquid crystal panel of three sheets for blue are irradiated. Light modulation is carried out based on a video signal, the red and green by which outgoing radiation is carried out, and a blue image beam of light are compounded in the color composition section (it constitutes from a dichroic prism etc.), and expansion projection is carried out with the projector lens of a projection area at a screen. Using what has the 3rd PBS array 9 the same as the 1st PBS array 3 when using the thing of a p-polarized light incoming radiational type for a liquid crystal panel, when a liquid crystal panel is an s-polarized light incoming radiational type, the same thing as the 2nd PBS array 7 is used for the 3rd PBS array 9.

[0013] In the case of DLP-type projector equipment, incidence of the 1st polarization beam of light (p-polarized light component) which penetrated PBS4 as shown in drawing 3 , and the 2nd polarization beam of light (s-polarized light component) reflected by PBS4 is carried out to the color separation section (it constitutes from a dichroic mirror etc.) of optical system 21 together. Moreover, red, It separates into the beam of light of green and blue. With the beam of light of the red from the color separation section, green, and blue The red of the light reflex component (DMD) section, The image beam of light of three colors which irradiate the green and blue mirror component for each pixels, were made to rotate the mirror component of the pixel concerned based on a video signal, were made to reflect an incident ray in the predetermined direction, and were reflected is compounded in the color composition section, and expansion projection is carried out with the projector lens of a projection area at a screen.

[0014] Since the 1st polarization beam of light which penetrates PBS4, and the 2nd polarization beam of light reflected by PBS4 have the the same optical axis, in the case of the example of drawing 1 , thus, the beam of light by which outgoing radiation is carried out from 3rd PBS9 Since incidence is carried out to the color separation section by the same incident angle also with the beam of light from the 1st light source lamp 1, or the beam of light from the 2nd light source lamp 5 By setting up the incident angle to the color separation section suitably, color separation of the beam of light from two light source lamps can both be carried out in the optimal condition, and the good color separation engine performance is obtained, and the use effectiveness of a light source beam of light can be gathered. Moreover, since incidence is carried out to the light reflex component section by whenever [incident angle / with the same beam of light from two light source lamps] in the case of the example of drawing 3 and the reflective direction of two beams of light agrees, as for the image on which it is projected, articulation (resolution) becomes high the thing of high brightness.

[0015]

[Effect of the Invention] Since according to the projector equipment by this invention an optical axis is made to agree and the beam of light from two light source lamps is piled up as explained above Since the incident angle of the beam of light from two light source lamps to a dichroic mirror is the same in a liquid crystal projector, the color separation engine performance can both be set up the optimal. A difference cannot arise in the direction reflected since the incident angle of the beam of light from two light source lamps to a light reflex component is the same, but the articulation (resolution) of a projection image can be raised, and the quality of a projection image can be raised, and the utilization factor of a light source beam of light can be raised in a DLP projector.

[Translation done.]

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the important section block diagram of one example of the projector equipment by this invention.
[Drawing 2] It is the important section detail drawing of the 1st PBS array and the 2nd PBS array.
[Drawing 3] It is the important section block diagram of other examples of the projector equipment by this invention.
[Drawing 4] It is drawing showing an example of the light source section of conventional projector equipment.
[Description of Notations]
1 Five The 1st and 2nd light source lamp
2, 6, 8 The 1st, 2nd, and 3rd integrator lens
3, 7, 9 The 1st, 2nd, and 3rd PBS array
4 PBS
10 21 Optical system
11, 12, 14, 15 PBS side
13 Lambda/2 Plate
31 32 Lamp
33 Triangular Mirror

[Translation done.]

(19)日本国特許庁（ＪＰ）　(12)公開特許公報（Ａ）　(11)特許出願公開番号
特開2001－264697
（P2001－264697A）
(43)公開日　平成13年９月26日(2001.9.26)

(51)Int.Cl.⁷	識別記号	ＦＩ		テーマコード（参考）
Ｇ０２Ｂ　27/28		Ｇ０２Ｂ　27/28	Ｚ	２Ｈ０８８
Ｇ０２Ｆ　1/13	５０５	Ｇ０２Ｆ　1/13	５０５	２Ｈ０９１
1/13357		Ｇ０３Ｂ　21/14	Ｂ	２Ｈ０９９
Ｇ０３Ｂ　21/14		33/12		５Ｃ０５８
33/12		Ｇ０９Ｆ　9/00	３６０Ｄ	５Ｇ４３５

審査請求　未請求　請求項の数７　ＯＬ　（全５頁）　最終頁に続く

(21)出願番号　特願2000－75418(P2000－75418)

(22)出願日　平成12年３月17日(2000.3.17)

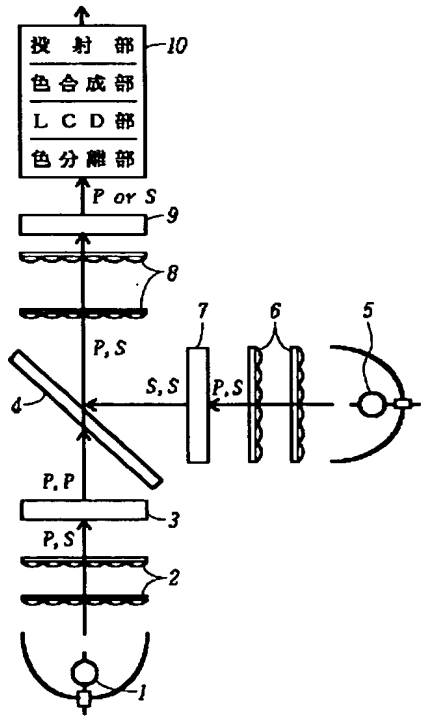
(71)出願人　000006611
株式会社富士通ゼネラル
神奈川県川崎市高津区末長1116番地

(72)発明者　高橋　真
川崎市高津区末長1116番地　株式会社富士通ゼネラル内

最終頁に続く

(54)【発明の名称】　プロジェクタ装置

(57)【要約】
【課題】　二つの光源ランプからの光線を光軸を合致させて重ね合わせ、後段の光学系に入射する。
【解決手段】　光源ランプ１からの光線をインテグレータレンズ２で集光し、ＰＢＳアレイ３でｐ偏光光線に揃え、ＰＢＳ４を透過させ、光源ランプ５からの光線をインテグレータレンズ６で集光し、ＰＢＳアレイ７でｓ偏光光線に揃え、ＰＢＳ４で反射させ、ＰＢＳ４からのｐ、ｓ偏光の光線をインテグレータレンズ８で集光し、ＰＢＳアレイ９でｐ偏光光線（又はｓ偏光光線）に揃え、後段の光学系10に入射する。ＰＢＳ４で反射される光源ランプ５からの光線の光軸が光源ランプ１からの光線の光軸と合致するように光源ランプ５、インテグレータレンズ６およびＰＢＳアレイ７を配置する。



1

【特許請求の範囲】

【請求項１】　第１光源ランプと、第１光源ランプからの光線を第１インテグレータレンズを介して入射し、所定の偏光面の第１偏光光線に揃えて出射する第１ＰＢＳ（偏光ビームスプリッタ）アレイと、第２光源ランプと、第２光源ランプからの光線を第２インテグレータレンズを介して入射し、前記第１偏光光線と90°異なる偏光面の第２偏光光線に揃えて出射する第２ＰＢＳアレイと、前記第１ＰＢＳアレイからの第１偏光光線を透過すると共に第２ＰＢＳアレイからの第２偏光光線を反射するＰＢＳとを設け、ＰＢＳで反射される第２偏光光線の光軸がＰＢＳを透過する第１偏光光線の光軸と合致するように前記第２光源ランプ、第２インテグレータレンズおよび第２ＰＢＳアレイを配置し、ＰＢＳからの第１偏光光線および第２偏光光線を後段の光学系に入射し、光変調を行い、スクリーンに投射するようにしたプロジェクタ装置。

【請求項２】　前記第１ＰＢＳアレイは、第１インテグレータレンズを介して入射される第１偏光光線を透過すると共に、入射される第２偏光光線を第１偏光光線と同じ偏光面の光線に変換して出射するものでなり、前記第２ＰＢＳアレイは、第２インテグレータレンズを介して入射される第２偏光光線を透過すると共に、入射される第１偏光光線を第２偏光光線と同じ偏光面の光線に変換して出射するものでなる請求項１記載のプロジェクタ装置。

【請求項３】　前記後段の光学系は、前記ＰＢＳからの第１偏光光線および第２偏光光線を第３インテグレータレンズを介して入射し、偏光面を揃えて出射する第３ＰＢＳアレイと、第３ＰＢＳアレイからの光線を赤、緑および青の光線に分離する色分離部と、色分離部からの赤、緑および青の光線で赤、緑および青色用の三枚の液晶パネルを照射し、映像信号に基づき光変調し、赤、緑および青の映像光線を出射する液晶パネル部と、液晶パネル部からの赤、緑および青の映像光線を合成する色合成部と、色合成部からの映像光線をスクリーンに投射する投射部とから構成してなる請求項１記載のプロジェクタ装置。

【請求項４】　前記第３ＰＢＳアレイは、前記ＰＢＳからの第１偏光光線を透過すると共に第２偏光光線を第１偏光光線と同じ偏光面の光線に変換して出射するものを用い、前記三枚の液晶パネルは第１偏光光線を光変調する形式のものを用いるようにした請求項３記載のプロジェクタ装置。

【請求項５】　前記第３ＰＢＳアレイは、前記ＰＢＳからの第２偏光光線を透過すると共に第１偏光光線を第２偏光光線と同じ偏光面の光線に変換して出射するものを用い、前記三枚の液晶パネルは第２偏光光線を光変調する形式のものを用いるようにした請求項３記載のプロジェクタ装置。

2

【請求項６】　前記後段の光学系は、前記ＰＢＳからの第１偏光光線および第２偏光光線を赤、緑および青の光線に分離する色分離部と、色分離部からの赤、緑および青の光線で赤、緑および青色用の各画素のミラー素子を照射し、映像信号に基づき各画素別にミラー素子を回転させ、入射光線を所定の方向に反射する光反射素子部と、光反射素子部で反射された三色の映像光線を合成する色合成部と、色合成部からの映像光線をスクリーンに投射する投射部とから構成してなる請求項１記載のプロジェクタ装置。

【請求項７】　前記第１偏光光線はｐ偏光成分であり、前記第２偏光光線はｓ偏光成分である請求項１乃至６のいずれかに記載のプロジェクタ装置。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】本発明はプロジェクタ装置に係り、二つの光源ランプからの光線の光軸を重ね合わせるための光学機構に関する。

【０００２】

【従来の技術】プロジェクタ装置の輝度を上げるため光源ランプを二個使用する場合、例えば、図４に示す如く、二つのランプ31および32からの光線を三角ミラー33で同方向（図の上方）に反射させ、後段の光学系、すなわち液晶プロジェクタの場合のダイクロイックミラー、あるいはＤＬＰ(Digital Light Processing)プロジェクタの場合の光反射素子（例えば、DMD(Digital Micro mirror Device)＝米国・テキサス・インスツルメンツ社）等に入射するのであるが、三角ミラー33で反射されたランプ31からの光線の光軸イとランプ32からの光線の光軸ロの経路は別々であり、光軸イの光線と光軸ロの光線とでは後段の光学系への入射角が異なるため、例えば、何れか一方のランプからの光線が最適な入射角で入射するように設定すれば他方のランプからの光線の入射角は最適値ではなくなり、この結果、光線の利用効率の低下のみならず、色分離光学系では色分離の精度が低下し、光反射素子では反射方向に差が生じる等、映像品質の低下の要因となる。

【０００３】

【発明が解決しようとする課題】本発明は、二つの光源ランプからの光線を光軸を一致させて重ね合わせ、光源ランプからの光線の利用効率を上げ、同時に投射画像の品質を向上することを目的とする。

【０００４】

【課題を解決するための手段】上記目的を達成するため、本発明のプロジェクタ装置では、第１光源ランプと、第１光源ランプからの光線を第１インテグレータレンズを介して入射し、所定の偏光面の第１偏光光線に揃えて出射する第１ＰＢＳ（偏光ビームスプリッタ）アレイと、第２光源ランプと、第２光源ランプからの光線を第２インテグレータレンズを介して入射し、第１偏光光

3

線と90°異なる偏光面の第２偏光光線に揃えて出射する第２ＰＢＳアレイと、第１ＰＢＳアレイからの第１偏光光線を透過すると共に第２ＰＢＳアレイからの第２偏光光線を反射するＰＢＳとを設け、ＰＢＳで反射される第２偏光光線の光軸がＰＢＳを透過する第１偏光光線の光軸と合致するように第２光源ランプ、第２インテグレータレンズおよび第２ＰＢＳアレイを配置し、ＰＢＳからの第１偏光光線および第２偏光光線を後段の光学系に入射し、光変調を行い、スクリーンに投射するようにする。

【０００５】前記第１ＰＢＳアレイは、第１インテグレータレンズを介して入射される第１偏光光線を透過すると共に、入射される第２偏光光線を第１偏光光線と同じ偏光面の光線に変換して出射するものでなり、第２ＰＢＳアレイは、第２インテグレータレンズを介して入射される第２偏光光線を透過すると共に、入射される第１偏光光線を第２偏光光線と同じ偏光面の光線に変換して出射するものでなる。

【０００６】そして、後段の光学系を、ＰＢＳからの第１偏光光線および第２偏光光線を第３インテグレータレンズを介して入射し、偏光面を揃えて出射する第３ＰＢＳアレイと、第３ＰＢＳからの光線を赤、緑および青の光線に分離する色分離部と、色分離部からの赤、緑および青の光線で赤、緑および青色用の三枚の液晶パネルを照射し、映像信号に基づき光変調し、赤、緑および青の映像光線を出射する液晶パネル部と、液晶パネル部からの赤、緑および青の映像光線を合成する色合成部と、色合成部からの映像光線をスクリーンに投射する投射部とを設けて構成する。

【０００７】この場合、第３ＰＢＳアレイに、ＰＢＳからの第１偏光光線を透過すると共に第２偏光光線を第１偏光光線と同じ偏光面の光線に変換して出射するものを用い、三枚の液晶パネルは第１偏光光線を光変調する形式のものを用いるようにするか、または、第３ＰＢＳアレイに、ＰＢＳからの第２偏光光線を透過すると共に第１偏光光線を第２偏光光線と同じ偏光面の光線に変換して出射するものを用い、三枚の液晶パネルは第２偏光光線を光変調する形式のものを用いるようにする。

【０００８】あるいは、後段の光学系は、ＰＢＳからの第１偏光光線および第２偏光光線を赤、緑および青の光線に分離する色分離部と、色分離部からの赤、緑および青の光線で赤、緑および青色用の各画素のミラー素子を照射し、映像信号に基づき各画素別にミラー素子を回転させ、入射光線を所定の方向に反射する光反射素子部と、光反射素子部で反射された三色の映像光線を合成する色合成部と、色合成部からの映像光線をスクリーンに投射する投射部とを設けて構成してもよい。

【０００９】なお、上記第１偏光光線は、例えば、ｐ偏光成分であり、第２偏光光線はｓ偏光成分である。

【００１０】

4

【発明の実施の形態】発明の実施の形態を実施例に基づき図面を参照して説明する。図１は本発明によるプロジェクタ装置の一実施例の要部構成図で、図の１は第１光源ランプ、２は第１インテグレータレンズ、３は第１ＰＢＳアレイ、４はＰＢＳ、５は第２光源ランプ、６は第２インテグレータレンズ、７は第２ＰＢＳアレイ、８は第３インテグレータレンズ、９は第３ＰＢＳアレイ、10は、色分離部、ＬＣＤ（液晶パネル）部、色合成部および投射部からなる光学系である。

【００１１】第１光源ランプ１からの白色光線は第１インテグレータレンズ２で集光され、第１ＰＢＳアレイ３に入射する。第１ＰＢＳアレイ３は、例えば、図２（イ）に示す如くに構成され、入射面のａ～ｂ部分に第１インテグレータレンズ２からの光線を入射し、第１偏光光線（ｐ偏光成分）はＰＢＳ面11を透過し、第２偏光光線（ｓ偏光成分）はＰＢＳ面11および12で反射し、λ/2板13に入射し、偏光面を90°回転し、第１偏光光線に変換されて出射し、これらの第１偏光光線はＰＢＳ４を透過する。一方、第２光源ランプ５からの白色光線は第２インテグレータレンズ６で集光され、第２ＰＢＳアレイ７に入射する。第２ＰＢＳアレイ７は、例えば、図２（ロ）に示す如くに構成され、入射面のｃ～ｄ部分に第２インテグレータレンズ６からの光線を入射し、第１偏光光線（ｐ偏光成分）はＰＢＳ面14を透過し、λ/2板13で偏光面を90°回転し、第２偏光光線（ｓ偏光成分）となって出射され、第２インテグレータレンズ６からの第２偏光光線はＰＢＳ面14および15で反射されて出射し、ＰＢＳ４で反射される。このとき、ＰＢＳ４で反射される第１光源ランプ５からの光線の光軸が第１光源ランプ１からの光線の光軸と合致するように、第２光源ランプ５、第２インテグレータレンズ６および第２ＰＢＳアレイ７を配置する。

【００１２】液晶式のプロジェクタ装置の場合、図１に示す如く、ＰＢＳ４からの第１、第２偏光光線を第３インテグレータレンズ８で集光し、第３ＰＢＳアレイ９で偏光面を揃え、第１偏光光線または第２偏光光線とし、後段の光学系10の色分離部（ダイクロイックミラー等で構成）に入射し、赤、緑および青の光線に分離し、ＬＣＤ部の赤、緑および青色用の三枚の液晶パネルを照射し、映像信号に基づき光変調し出射される赤、緑および青の映像光線を色合成部（ダイクロイックプリズム等で構成）で合成し、投射部の投射レンズでスクリーンに拡大投射する。液晶パネルにｐ偏光入射型のものを用いる場合は第３ＰＢＳアレイ９は第１ＰＢＳアレイ３と同じものを用い、液晶パネルがｓ偏光入射型の場合は第３ＰＢＳアレイ９に第２ＰＢＳアレイ７と同じものを用いる。

【００１３】また、ＤＬＰ式のプロジェクタ装置の場合、図３に示すように、ＰＢＳ４を透過した第１偏光光線（ｐ偏光成分）とＰＢＳ４で反射された第２偏光光線

5

（ｓ偏光成分）とを一緒に光学系21の色分離部（ダイクロイックミラー等で構成）に入射し、赤、緑および青の光線に分離し、色分離部からの赤、緑および青の光線で光反射素子（ＤＭＤ）部の赤、緑および青色の各画素用のミラー素子を照射し、映像信号に基づき当該画素のミラー素子を回転させ、入射光線を所定の方向に反射させ、反射された三色の映像光線を色合成部で合成し、投射部の投射レンズでスクリーンに拡大投射する。

【００１４】このように、ＰＢＳ４を透過する第１偏光光線とＰＢＳ４で反射された第２偏光光線とは光軸が同じであるから、図１の例の場合、第３ＰＢＳ９から出射される光線は、第１光源ランプ１からの光線でも第２光源ランプ５からの光線でも同じ入射角で色分離部に入射するので、色分離部への入射角を適宜に設定することにより、二つの光源ランプからの光線を共に最適の状態で色分離することができ、良好な色分離性能が得られ、かつ、光源光線の利用効率を上げることができる。また、図３の例の場合、二つの光源ランプからの光線が同じ入射角度で光反射素子部に入射するので、二つの光線の反射方向が合致するので、投射される映像は明瞭度（解像度）が高く、かつ、高輝度のものとなる。

【００１５】

【発明の効果】以上に説明したように、本発明によるプロジェクタ装置によれば、二つの光源ランプからの光線を光軸を合致させて重ね合わせるものであるから、液晶プロジェクタではダイクロイックミラーへの二つの光源

6

ランプからの光線の入射角が同じなので色分離性能を共に最適に設定することができ、ＤＬＰプロジェクタでは光反射素子への二つの光源ランプからの光線の入射角が同じであるから反射される方向に差が生じず、投射映像の明瞭度（解像度）を高めることができるもので、投射映像の品質を高め、かつ、光源光線の利用率を上げることができる。

【図面の簡単な説明】

【図１】本発明によるプロジェクタ装置の一実施例の要部構成図である。

【図２】第１ＰＢＳアレイおよび第２ＰＢＳアレイの要部詳細図である。

【図３】本発明によるプロジェクタ装置の他の実施例の要部構成図である。

【図４】従来のプロジェクタ装置の光源部の一例を示す図である。

【符号の説明】

１、５　第１、第２光源ランプ

２、６、８　第１、第２、第３インテグレータレンズ

３、７、９　第１、第２、第３ＰＢＳアレイ

４　ＰＢＳ

10、21　光学系

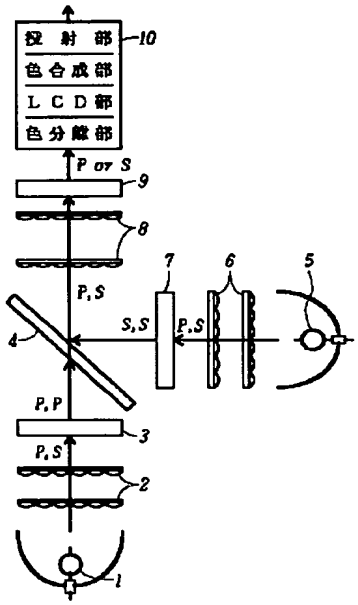
11、12、14、15　ＰＢＳ面

13　λ/2板

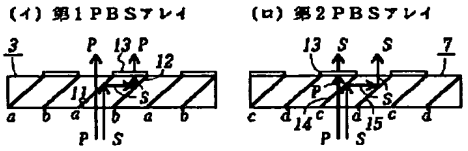
31、32　ランプ

33　三角ミラー

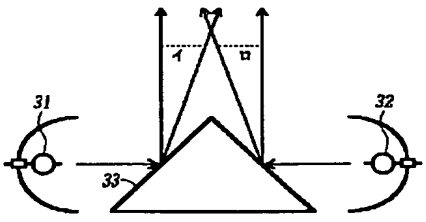
【図１】



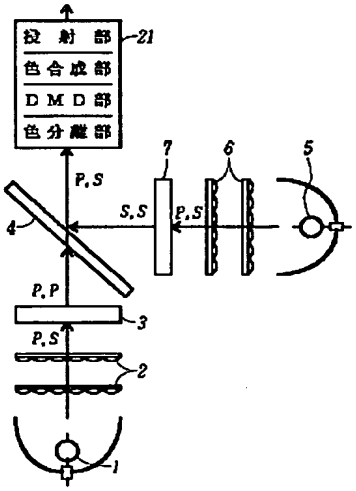
【図２】



【図４】



【図３】



フロントページの続き

(51)Int.Cl.[7]		識別記号	F I		テーマコード(参考)
G09F	9/00	360	H04N	5/74	A
H04N	5/74		G02F	1/1335	530

Fターム(参考) 2H088 EA14 EA15 HA20 HA21 HA24
2H091 FA10Z FA14Y FA26X FA26Z
FA41Z FD03 LA03 LA16
MA07
2H099 AA12 BA09 CA02 CA08 DA05
5C058 AA06 BA25 EA02 EA11 EA12
EA13 EA21 EA51
5G435 AA02 AA03 AA04 BB11 BB12
BB15 BB16 BB17 CC09 CC12
DD05 EE25 FF03 FF05 GG02
GG04 GG10 GG23 GG26 GG27
GG28 GG46 LL15